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Comments: *From the SCS Chief*

Soil and Water Conservation—A Worldwide Concern

The drought and famine in Ethiopia and the Sudan in Africa spotlight the problems facing developing nations around the world.

In some countries, severe problems with soil and climate force large populations to depend on small areas of arable land to produce their food and fiber, mostly unsuccessfully. In other countries, traditional agricultural practices have severely depleted soil, water, and other resources, reducing production to below subsistence levels.

The only long-term solution is establishing a stable agriculture in these countries. The proper use and protection of natural resources is the first step.

The Soil Conservation Service is recognized worldwide for its expertise in soil and water conservation, natural resource surveys, and rural community protection and development. The agency also has a tradition of sharing that expertise with farmers, livestock producers, and government officials in developing countries.

Through USDA's Office of International Cooperation and Development (OICD), SCS provides assistance through OICD-administered reimbursement agreements with foreign governments, international organizations, and other U.S. Government agencies.

In fiscal year 1985, through the U.S. Agency for International Development and other international organizations, SCS responded to requests for technical assistance by assigning 158 staff members to 41 different countries for both short- and long-term assignments. They are helping with irrigation management, flood protection, soil survey, soil management, erosion control, and many other aspects of natural resource management.

A stable agriculture promotes economic and political stability . . . and that leads to stable trading partners for U.S. farm and nonfarm goods. The people we send to these developing countries can help them get started. And we benefit, too. Our people can learn from the experience and improve their technical knowledge and professional capabilities. And when they come back to the United States, they can apply that knowledge to problems here at home.

SCS is proud to extend its service abroad. It helps other countries and it helps us. We'll be emphasizing cooperative agreements with other nations to promote these mutual benefits.

Wilson Scaling

Cover: Farmers in the West African country of The Gambia load a trailer with soil to be used in building a diversion that will keep salt water from intruding onto their rice fields. See article beginning on page 4. (Photo by E. Joseph Larson, chief, Media Services Branch, Public Information, SCS, Washington, DC.)

John R. Block
Secretary of Agriculture

Wilson Scaling, Chief
Soil Conservation Service

All programs of the U.S. Department of Agriculture are available to everyone without regard to race, creed, color, sex, age, or national origin.

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SCS Helps to Protect Soil and Water Around the World

The Soil Conservation Service shares its technical expertise in soil and water conservation, natural resource surveys, and rural community protection and development with other countries through the U.S. Department of Agriculture's (USDA) Office of International Cooperation and Development (OICD).

SCS provides technical assistance through OICD-administered reimbursement agreements with foreign governments, international organizations, and other U.S. Government agencies.

SCS shares its technical expertise and knowledge by: assigning technical specialists for international assistance, exchanging scientific teams with countries that have agricultural science technology that could benefit the United States, training foreign nationals in the United States and overseas, providing foreign visitors with the opportunity to observe SCS activities throughout the United States, participating in meetings of international technical and professional societies, and participating in planning conferences with other agencies involved in international programs.

Employee assignments to provide technical assistance to foreign countries may be long term, or resident, assignments; or they may be short term, or temporary duty, assignments. Resident assignments usually last about 2 years and provide a country with technical services and leadership for a special natural resource conservation project. Most resident assignments are made in response to a request from the U.S. Agency for International Development (AID) under a Participating Agency Service Agreement (PASA).

This year, SCS has sent, or is planning to send, employees on long-term assignments in nine different countries—Egypt, Guatemala, Indonesia, Mexico, Nepal, Pakistan, Peru, Saudi Arabia, and The Gambia.

Egypt

An SCS agricultural engineer specializing in irrigation is helping to analyze the technical, social, and economic factors influencing the development of improved irrigation systems in Egypt. The assignment includes helping to design and carry out projects aimed at properly developing Egypt's land and water resources. AID is assisting Egypt's Ministry of Irrigation in implementing the irrigation management project.

Guatemala

SCS plans to send a soil conservationist in early 1986 to provide technical assistance, especially in irrigation, and program direction to the Ministry of Agriculture and Food through a Small Farm Diversification System Project sponsored by AID. The project objective is to improve the economic well-being of rural Guatemalans in the northwestern highlands. The project is designed to increase crop yields and diversify farming, improve local diets, and produce a marketable surplus to improve incomes.

Indonesia

A team of five SCS soil conservationists is expected to be stationed in Indonesia by March 1986. They will be serving under a PASA with AID to support Indonesia's Upland Agriculture and Conservation Project (UACP). The team will investigate conditions, determine needs, and provide recommendations for officials of the UACP to use in strengthening the country's institutional and technical capability for upper watershed development.

Mexico

SCS is carrying out a long-term soil conservation project in Mexico under a reimbursable agreement between USDA, Mexico, and the World Bank. Four SCS specialists—an agronomist, a soil scientist, an engineer, and a plant materials specialist—are working on a project which is a part of the Tropical Agriculture Project funded by the World Bank and the Integrated Rural Development Program in the Humid Tropics of the Mexican Ministry of Agriculture. The overall goal of the project is to increase productivity by improving the technological and managerial capability of Mexican technicians and farmers.

Nepal

An SCS soil conservationist served as a team leader on a Resource Conservation and Utilization Project designed to protect Nepal's natural resources. The project included reforestation and improved management of rangeland, cropland, and watershed areas.

Pakistan

A team of SCS conservation specialists is assisting the Government of Pakistan in its Federally Administered Tribal Areas Development Project. The Tribal Areas, located along Pakistan's northwestern border, are seven administrative districts with special legal status. AID is providing financial assistance for the project, which is designed to improve irrigation efficiency and explore the use of ground water in this generally dry, mountainous region. Project activities will include the construction and maintenance of irrigation systems, test wells, and small well-fields.

Soil Conservation in The Gambia

The Gambia
An SCS soil conservationist is serving under a PASA to assist the Soil and Water Management Unit of the Ministry of Agriculture and Environment of The Gambia to plan and carry out a soil and water management program. (See article beginning on page 4.)

Peru
SCS is providing long-term technical assistance to the Government of Peru in establishing a national soil and water conservation system within the Directorate of Water and Soil of the Ministry of Agriculture. SCS assistance includes instruction in what kinds of soil conservation practices to use as well as how to convince farmers to use the practices.

Saudi Arabia
Eight SCS soil scientists were assigned to work with the Saudi Arabian Ministry of Agriculture and Water on the General Soil Map of the Kingdom of Saudi Arabia. Six of the team members completed their resident assignments this year and two remain in Riyadh to complete the map work. The general soil map with map unit descriptions and interpretive data is planned to be published in English and Arabic by early 1986. The general soil map will enable Saudi Arabia to identify and plan the use of its arable land.

During fiscal year 1985, SCS also sent more than 140 employees on short-term assignments to both developed and developing countries. Thirty-six of these employees provided technical assistance in resource conservation to 13 different countries. Seventeen employees were involved in an exchange of agricultural specialists with eight countries. Twenty-two employees carried out assignments in 13 countries under the Soil Management Support Services, an AID project implemented by SCS to provide technical assistance in soil survey, soil classification, and use and management of soils to developing countries. Sixty-seven employees participated in soil and water related international meetings in 13 countries.

SCS has a long history of international involvement. The agency's first chief, Hugh Hammond Bennett, and his assistant, Walter C. Lowdermilk, traveled throughout the world in the 1930's and 1940's to view soil and water conservation problems in other countries. SCS also hosted many visitors from other countries who wanted to see what the United States was doing to combat serious soil erosion and land use problems.

SCS continues to be heavily involved with training assistance for officials, scientists, and technicians from other countries. During this past year, approximately 250 visitors from more than 40 countries observed conservation practices at many locations throughout the United States.

Gail Osborne Roane,
program management specialist, International Activities Division, SCS, Washington, DC

Nancy M. Garlitz,
associate editor, *Soil and Water Conservation News*, SCS, Washington, DC

SCS employees helped farmers in Peru use handmade engineering tools to check the construction of conservation practices such as terraces.

The Gambia may be one of the smallest nations in Africa, but it's big when it comes to soil conservation.

It was the first African country to start a national soil survey and one of the first to establish a permanent agency to help farmers combat soil erosion and water pollution.

This has taken place over the past 6 years with the help of USDA's Soil Conservation Service through the U.S. Agency for International Development and USDA's Office of International Cooperation and Development. The country can now be used as a model in establishing soil and water conservation units in other African nations.

The Gambia is located on Africa's west coast, about 12 degrees above the Equator. It is a narrow strip of land averaging about 7 miles on each side of the Gambia River and extending from the Atlantic Ocean 250 miles inland. It's about the size of Connecticut, with a population of some 700,000. It was granted independence from England in 1965. The country gained prominence a few years ago when it was featured in Alex Hailey's book *Roots* as the birthplace of Kunta Kinte.

Except for a peanut oil processing plant, the country has no industry, no coal, natural gas, or oil resources, no precious metal or gem mines.

The Gambian economy depends on its soil. Agricultural products make up 95 percent of The Gambia's exports. Agriculture is responsible for 85 percent of its employment. And it contributes up to 90 percent of the average Gambian's income. The country's single most important crop is peanuts.

For many years, soil erosion wasn't a problem in The Gambia. Small tracts of land were cleared and cultivated by hand. After a few years of growing crops—primarily peanuts—the land was returned to natural fallow and another tract was cleared. Under this system, the soil was fairly well protected from the intense wet season rains.

In recent years, the country's growing population and the desire for more export income have put increased demand on the land for crop production. In many areas, hand cultivation has given way to oxen and one-row mechanical planters. Consequently, more and more land has been cleared and the acreage in continuous cultivation has increased sharply.

As a result, more land is exposed to the tropical rains and soil erosion has accelerated greatly.

In addition, the steady intrusion of salt water onto once-productive swamp rice areas has forced farmers to abandon hundreds of areas along the Gambia River and its tributaries. Many villages that were once self-sufficient in rice production have had to turn to other sources for this staple food.

The Soil and Water Management Unit was started in The Gambia Department of Agriculture in 1978 to help the nation's farmers install soil and water conservation practices, designed to reduce soil erosion and improve water quality.

The Soil and Water Management Unit is funded by the Gambian government and the U.S. Agency for International Development. Since its beginning, the unit's staff has been assisted by a technical advisor from the Soil Conservation Service. Arnold Snowden was the first advisor, working in The Gambia from 1979 to 1983. On his team were two other SCS'ers, Ivan Ratcliff, soil scientist, and Harvey Nessmith, plant scientist.

Snowden, now assistant director of the SCS International Activities Division in Washington, DC, designed the unit, selected candidates for training, equipped the unit, and established liaison with the various government agencies. It must be remembered that there were no soil conservationists, no soil scientists, no agricultural engineers. Snowden started the agency from scratch.

Today most of the top-level Gambian professionals in the soil and water management unit have or will receive degrees from U.S. universities in such fields as soil science, agricultural engineering, agronomy, range science, and forestry. Other mid-level professionals have been trained in Nigeria and The Gambia.

Since 1983, Harvey Metz, SCS area conservationist from Lincoln, Nebr., has been advisor. Metz uses his engineering background to give staff members, especially mid-level professionals, practical experience in planning, surveying, and designing conservation projects throughout the country. John Fye, a Gambian trained in Louisiana, heads the soil survey unit.

Over the years, both Snowden and Metz have called on technical specialists from SCS for short-term help. Among these were

Mustapha Sonko, Kebba Manka, and Harvey Metz (left to right) discuss surveying techniques in laying out a contour on cropland around a Gambian village. Metz, former area conservationist in Lincoln, Nebr., is U.S. advisor to the Gambian soil conservation agency.

Robert Johnson, soil scientist, Clifford Carter, range conservationist; Robert Kral, agronomist; Keith Huffman, soil scientist; E. Joseph Larson, information specialist; and most recently, Donald Woodward, hydrologist.

The work of establishing a conservation program in a Third World country is far more complicated than merely applying our technology to their resource problems. The country's customs, culture, religion, and economy all play important roles. The Gambia is a developing nation, still quite primitive in many respects.

There are about 1,200 villages in the country, each with about 600 people. The average Gambian's income is about $300 a year. Outside the capital area of Banjul, there is no electricity or running water. Gambian women still use the mortar and pestle to prepare cereal grains for cooking. Wood is the primary source of fuel.

Although all land is owned by the government, the village leader has the authority to allocate the farmland around his village. Each farmer works about 2 to 3 acres of land and grows peanuts for sale to the government. He also grows millet, grain sorghum, and corn for family consumption. Rice, the Gambian's primary food, is usually grown by women, mainly along the Gambia River and its tributaries.

The use of oxen has become established throughout the countryside, but much of the farming is still done by hand. Chemical fertilizer, given by donor countries, is distributed by the government for use on the peanut crop—the export crop for which the government receives its much needed foreign exchange to purchase diesel fuel, petrol, rice, and other foods and supplies.

English is the official language of The Gambia, but outside the capital area it is seldom heard. Most Gambians speak one or two of five main tribal languages.

Despite the obstacles, good progress is being made in resource conservation.

In 1985, the soil and water conservation unit had projects underway throughout the country—projects to curb flooding, soil erosion, sedimentation, and salt water intrusion. The unit has three sections—planning, soil surveying, and engineering.

The unit surveys and establishes the contour lines for the farmers to follow in planting their crops; it designs and lays out the berms, levees, and dikes needed to divert storm water; it designs the structures to improve water quality. In turn, the village farmers must furnish the labor for all construction.

Finding labor has not been a problem, for the farmers have seen firsthand the damages caused by erosion and salt water. They may not know the solution, but they are more than willing to help install measures to correct the problem. Soil and water conservation in The Gambia is just getting started. Nevertheless, hundreds of farmers have seen the positive results and the word has spread to thousands of others.

If the soil and water management unit continues to receive the support of the Gambian government, it could be one of the most important tools in helping this Third World nation become self-sufficient in food production and increase its exports.

E. Joseph Larson,
chief, Media Services Branch, Public Information, SCS, Washington, DC

At left, John Fye, foreground, conducts a detailed study of the soil in Gambian field during the course of a soil survey. Fye, a native Gambian, is in charge of the country's soil survey program. The Gambia is the first African nation to initiate a national soil survey. Above, Mbemba Danso, Gambian Soil and Water Management staff, tells a group of farmers what conservation practices will be needed on their land to halt soil erosion and improve water quality.

News Briefs

Flexible Cropping for Montana Farmer Includes Chemical Fallow

Glacier County, Mont., farmer Roger Sammons believes he's getting better crop returns with a flexible cropping system. With flexible cropping, a farmer checks soil moisture in the spring and, based on soil moisture and predicted precipitation, decides whether there is enough moisture to plant or if fields should lie fallow for a season.

"You have to get the production when the moisture is available to produce a crop," Roger said. "It was too dry the summer of 1984 to recrop—or plant another crop in the same field—so we chemical fallowed 200 acres that had been cropped 3 years in a row."

Under chemical fallow, herbicides are used in addition to tillage operations to control moisture-robbing weeds in fallow fields. With chemical weed control, tillage operations can be reduced 25 to 50 percent.

Roger took over the reins of the family farm 1½ years ago after graduating from Montana State University with a major in agriculture business. His father Herb is retired but still keeps an eye on the operation.

"Dad has encouraged me to try new ideas as long as they make financial sense," Roger said. "We have been experimenting with flexible cropping as far back as 1981."

Roger admits that recropping fields instead of leaving them fallow for a year affects yields. His yields on the recropped acres are lower than the yields on the summer fallowed land. But because he's cropping more of his land, the total production over a 2-year period is increased.

"Although yields are lower on the recrop," Roger said, "the increased production over the total farm more than balanced the additional dollars invested."

While flexible cropping has been successful, Herb cautions his son to summer fallow as a bank account. Roger agrees, "Our goal is to go to a two-thirds or one-third summer fallow rotation. We would never go completely recrop."

Roger's flexible cropping system didn't require any new equipment. He seeds barley and spring wheat with a conventional drill, although this year he plans to use ACRA-Plant drill shoes—sharp, pointed openers on his hoe drill. This type of opener allows for better penetration which leads to better soil/seed contact.

In 1984, Roger used Roundup and Banvel plus a surfactant on the 200 acres he chemical fallowed. Roger said, "I used this combination because it gave me the broadest spectrum of control for the weeds I have." Roger was controlling wild oats, Persian darnel, Canada thistle, volunteer small grains, and tansy mustard.

He used plenty of water—10 gallons per acre—to get through the residue. His only problem was getting a good kill in the wheel tracks. He spot sprayed some Canada thistle to get good control.

Since it was so dry, the weeds never came back so only one chemical fallow operation was needed. Roger was very pleased with the results and chemical fallowed 800 acres this year.

Researchers back up Roger's success. An 8-year fallow and recrop study at Williston Experiment Station showed that herbicides are more effective when used early in the fallow period when soil moisture is greater. Mechanical tillage should be used later in the season. During years of below normal precipitation, the soil may become too dry to till. The tillage can be delayed and chemicals used to control weeds if necessary.

Montana farmer Roger Sammons uses a probe to check the depth of soil moisture.

Researchers also recommend leaving weed seeds on the surface exposed to the weather, where they lose their viability. Mechanical tillage in the early spring covers the weed seeds, causing them to germinate, or it brings to the surface buried weed seeds causing them to break dormancy.

According to Gary Tibke, Soil Conservation Service agronomist in Bozeman, some farmers like to cultivate early and get a uniform germination of weeds. They then use the chemical for the second operation.

In summer 1984, 40 operators who used chemical fallow in McCone County were asked what chemicals they used and how they rated the results.

For the first operation these farmers used Roundup and Glean or Roundup and Banvel. For the second application, they used Roundup and 2,4-D, Roundup and Banvel, or 2,4-D and Banvel. Not all farmers had to use a second application. Most of the farmers rated these combinations good to excellent.

Tibke recommends that anyone wanting to try chemical fallow should start with small acreage like Roger and work out the management problems. He also recommends visiting with farmers who have chemical fallowed and learning from their experience.

Chemical fallow can be economically competitive to conventional fallow. But the chemical must be applied at the right time, spray equipment must be calibrated, and adequate amounts of water must be used to make chemical fallow work.

Merlin Berg,
district conservationist, SCS, Cut Bank, Mont.

SCS Studies Shift to Irrigation in Washington

The Soil Conservation Service is helping to plan for the irrigation of 400,000 acres in central Washington. A 2-year study is underway by the agency to develop cost-effective irrigation systems that will enable farmers to reduce soil erosion, improve water quality, and conserve water in the East High Area of the Columbia River Basin.

The U.S. Bureau of Reclamation is currently considering alternative plans for delivering irrigation water to the area from the Columbia River. SCS is studying alternative methods for managing the soil and water once the water is delivered to farms.

The Columbia River is a major source of hydroelectric power and irrigation water for the Pacific Northwest. About a half million acres is irrigated with water from the reservoir behind Grand Coulee Dam on the Columbia. When finished, the complete Columbia Basin Project will provide irrigation water to 1.1 million acres.

The East High Area is a plain of wind-deposited silt loam soils in Grant, Adams, Lincoln, and Franklin Counties. Slopes range from nearly level to 30 percent. The area receives 8 to 10 inches of rainfall a year and is used mostly to grow dryland winter wheat in a 2-year rotation with summer fallow. When irrigation water becomes available, the dominant land use is expected to change to a wide variety of irrigated crops.

Concerned that this conversion to irrigated cropland could create soil and water resource problems, the Washington State Department of Ecology requested SCS assistance in planning for optimum irrigation development and protection of the soil and water resources. SCS responded with the East High Columbia Basin Cooperative River Basin Study.

With assistance from the eight conservation districts in the Columbia Basin, SCS is providing most of the technical staff. Arrangements have been made with area farmers to conduct field tests on farms that are irrigated with water from deep wells (a rapidly diminishing water source).

The study has two major objectives: to develop predictive models with which to identify and compare conservation treatment alternatives and to provide local, State, and other Federal conservation programs with planning assistance. Data are being gathered on water intake rates, crop budgets, soil classification, concentrated-flow erosion, soil loss, yields, and nutrient loss.

The water intake rates of the soils are being measured to plan irrigation water application rates for various kinds of irrigation systems. This information is critical for helping farmers plan irrigation systems and crops that are compatible with their soils.

Crop budgets are being projected to help individual farmers develop budgets for their selected crops and irrigation systems. Farmers will be able to accept a standard budget or tailor one for their special needs.

The soils in the East High Area have been classified and mapped based on dryland conditions. SCS soil scientists in the study are identifying the steps necessary to complete a soil survey that satisfies the planning needs for irrigation management.

Predictive planning models are being developed to estimate concentrated-flow erosion. These models will help planners to estimate nutrient loss and the effects on crop yields.

Knowing the soil characteristics will help SCS give better advice to farmers planning to irrigate. At left, Jay Kehne, SCS soil scientist, examines the texture of a soil used for dryland wheat in Grant County, Wash. At right, Kehne is joined by Fabian Fogerson, SCS conservation technician, in center, and Kirk Jungers, a student trainee, to conduct additional field tests.

Soil-loss data are being gathered by collecting sediment in large cloth socks between the furrows on various existing irrigation systems for different slopes and crops. These data will be used to develop a predictive model for estimating the average annual soil loss for alternative irrigation and management systems.

Crop yield information is being used to develop a model to predict the short-term yield effects of different irrigation systems under various levels of management. The long-term yield effects due to loss of soil productivity from erosion will also be predicted.

Nutrient-loss data are being gathered by studying sediment and runoff water, fertilization rates, and soil tests. These data will be used to estimate the value of the nutrients lost from over-application of water or from soil loss, or both.

SCS and the University of Idaho plan to integrate these data into a data base and develop an Irrigation Systems Planning Model. SCS and conservation district personnel will be able to use this model to provide land managers with quick and easy comparisons of alternative irrigation systems and management. Computer terminals will display the predicted impact of each alternative on soil loss, crop yields, nutrient loss, concentrated-flow erosion, and economics.

As expected, preliminary results indicate that water runoff will increase many times over with irrigation and the production of crops such as corn, potatoes, and peas. More runoff could easily result in more erosion and a decrease in water quality. By identifying these potential problems before they occur, however, methods can be designed to minimize them.

"Often SCS becomes involved after a problem develops with irrigation systems," said Lynn A. Brown, SCS State conservationist in Washington. "This study will allow us to plan ahead and apply preventive measures before the problems arise as this area changes from dry cropland to irrigated land. With this approach we can solve problems early, and save farmers and the public money in the long run."

Ernest A. Jager,
field team leader, East High Columbia Basin Cooperative River Basin Project, SCS, Moses Lake, Wash.

Farmers in the East High area who are already irrigating with water from deep wells are allowing SCS to gather data on the effects of different irrigation practices on different crops and soils. At left, Chet Jahns, SCS agricultural engineer, aligns a sediment-collecting sock between rows of irrigated potatoes.

SCS Tests Digitized Map Overlays

For years, soil scientists have dreamed of better uses for the contour maps produced by the U.S. Geological Survey (USGS). Now—thanks to computer technology—some of their dreams are coming true.

To lay people, contour maps show the different levels of elevation of a landscape and nothing about the soils. To soil scientists, however, analysis of the different elevations in an area can reveal a lot about the topography, climate, plant and animal life, parent material, and other factors that over time determine soil characteristics and land use potentials.

The information on the contour maps is not easy to analyze because it is in the form of lines, with one line to the next representing a drop or rise in elevation of so many feet (usually 20). In a recent development, however, computer analyses became possible when the USGS was able to digitize the map lines to create an experimental data base. Researchers at the Earth Resources Observation Systems (EROS) Data Center at Sioux Falls, S. Dak., then coupled the data base—the digital elevation model (DEM)—with computer programs to generate map overlays of slope classes, aspect (direction of slope), and elevation classes.

The slope gradient, which directly affects runoff and many soil-forming processes, is a characteristic of all soils and greatly affects land use. So important is the slope class (or range) in identifying soils that soil scientists typically spend hours studying aerial photographs through a stereoscope to produce a pre-map before going into the field to map the soils. The stereoscope produces a three-dimensional image that helps to locate slopes on the landscape.

Aspect is also important in soil formation. In the Northern Hemisphere, the north-facing slopes are generally cooler and more moist than the south-facing slopes. As a result, there is usually more vegetation producing more organic matter on the north-facing slopes. More moisture on the north-facing slopes also results in clay particles and nutrients being carried deeper into the soils. As these processes continue,

the soils on the north-facing slopes develop characteristics that are different from those on the south-facing slopes.

In many areas, particularly in the rolling and steep terrain of the Western United States, there is a close relationship between elevation, precipitation, and temperature, which in turn affects the soils and vegetation. Some landform and terrace remnants also occur consistently at certain elevations. Where these relationships are established, elevation classes are useful in mapping the soils.

Encouraged by successful pilot studies in Nevada and Idaho, soil scientists of the Soil Conservation Service are currently using DEM-based overlays in the preparation of pre-maps for making soil surveys in Montana, Washington, New Mexico, Oregon, Arizona, and California. Field trials are also being conducted by soil scientists with the USDA's Forest Service and the U.S. Department of the Interior, Bureau of Land Management. These scientists are to meet early in 1986 to review their field experiences and make recommendations for standard DEM mapping products for future use.

By eliminating the necessity for stereoscoping, the digitized map overlays should save time for the surveyors. The overlays should also help surveyors to delineate soil map units, determine the extent of the different slope classes included in the map units, and recognize landmarks in the survey area. They are expected to be particularly useful in areas that are relatively inaccessible because of rough terrain or dense vegetation.

William U. Reybold,
national leader for soil geography, SCS, Washington, DC

Utility Company Controls Erosion

In the northwestern mountains of South Carolina just above Lake Jocassee, Duke Power Company is building the largest pumped-storage, hydroelectric station in the State.

Bad Creek Hydroelectric Station will go into commercial operation in 1992, giving the facility the capability of generating 2½ million megawatt-hours of electricity a year. Duke Power expects to use this electricity during brief periods of heavy customer demand instead of more expensive coal-fired generation.

The unique feature of a pumped-hydro station is that the units will be capable of both generating electricity and pumping water back into a storage reservoir. Lake Jocassee will collect and hold the water released when the units generate electricity. Then, when peak demands are over, the generating units will pump water back into the storage reservoir to be used again.

Building the facility is expected to take about 8 years; an access road into the site has already been built. But the steep terrain of the area has added a new dimension to Duke Power's project: soil erosion.

"Building anything in that hilly area is difficult because of potential soil erosion," said Alvin Freeman, Soil Conservation Service district conservationist, "but Duke has taken this into consideration and done an excellent job of preventing construction site erosion."

Freeman has worked closely with Duke Power in developing various soil erosion control approaches at the construction site. "Duke Power has really written a new chapter on erosion control," he said. "In fact, the utility has had to improvise ways to to provide effective erosion control in the mountainous terrain of the project site."

John Garton, a Duke Power biologist, agreed. "Erosion control is very important in this area because runoff drains into local trout streams. Since trout are very sensitive to sediment, we want to reduce it as much as possible through good erosion control techniques."

Duke Power engineers and biologists began developing a plan in the mid-seventies to minimize soil erosion during construction of the Bad Creek project. "In our plan, we have had to deal with erodible soils, steep terrain, and an annual rainfall that averages 75 inches and often exceeds 100 inches," Garton said.

A Clemson University research team headed by Dr. Ben Dysart is monitoring the water quality and stream bottom sediments in Howard Creek during construction. Duke Power biologists are also monitoring the trout populations and food organisms in the stream. The studies will document any change in Howard Creek during and after construction, Dysart said.

The project's erosion control work will stay 6 months ahead of construction, Garton said. A careful evaluation of the lay of the land and the potential impact on streams will be made to determine the proper erosion control approach.

"The steepness of the terrain and how long an area will be open to construction are major factors in determining erosion control methods for a specific area," Garton said. "In some areas we may be able to use sediment fences or basins to control sediment.

"But the real problem is when surface runoff concentrates during intense storms. Then runoff begins to collect, form gullies, and finally flow into open work areas. It can really cause significant erosion in a matter of minutes," he said.

To prevent the concentrated flow of water from rushing into a construction area, water breaks, berms, ditches, and plastic pipe systems will be used to divert it.

"The real key to our plan is how we manage the construction site," Garton said. "We don't plan to open an area for construction until we are ready to work and have an erosion control plan approved for the area. We also want to keep the size of construction areas to a minimum."

Following construction, each area will be completely revegetated with the right grasses to ensure a complete and permanent ground cover. "We have really looked to the Soil Conservation Service for guidance in this area, and their recommendations have paid off," Garton said.

Duke Power already has an audit team monitoring erosion control measures at the site every 5 weeks. The team reports to com-

pany management on the status of the work and makes recommendations to improve erosion control. The field monitoring studies are designed to allow Duke Power to evaluate the effectiveness of erosion control measures.

David C. White,
public affairs specialist, SCS, Columbia, S.C.

An Experimental Program for Cooperative Range Management

Cooperative range management is being fostered through pilot projects in three Western States. The projects, carried out through the Experimental Stewardship Program (ESP), are called the Challis ESP in Idaho; the East Pioneer ESP near Dillon, Mont.; and the Modoc/Washoe ESP near Cedarville, Calif.

As rancher Tom Chivers in Challis puts it, "The stewardship program hasn't met all our expectations, but it is still our best hope of having a say about decisions that so gravely affect our lives and our livelihood."

Before the early 1900's, some rangelands suffered from uncontrolled grazing, homesteading inroads, and political pressures. Established ranchers began to realize the need to improve the range. They first helped to establish the National Forests and then in the 1900's the Bureau of Land Management (BLM) in the U.S. Department of the Interior (USDI) and the Soil Conservation Service in the U.S. Department of Agriculture. In the ensuing years, conflict set in as BLM and USDA's Forest Service began to develop policy and impose regulations on the grazing of publicly owned rangeland. Many of these regulations were inconsistent between agencies and aroused the ire of State officials, ranchers, and environmentalists. This unrest was reflected in 1973 when the Natural Resources Defense Council filed suit against USDI accusing BLM of noncompliance with a national environmental policy established in 1969. As a result the court directed BLM to evaluate the environmental impact of livestock grazing on public lands signaling the need for a method of solving rangeland problems affecting people who manage commingled privately and publicly owned rangelands.

In 1979 the Secretaries of Agriculture and Interior implemented the Experimental Range Stewardship Program, authorized by the Public Rangeland Improvement Act of 1978, to bring ranchers and agency personnel together and improve the range.

The Public Rangeland Improvement Act directed BLM and the Forest Service to select three areas of commingled privately owned and public rangeland representative of the broad national spectrum of range conditions, trends, and forage values.

The act required BLM and the Forest Service to organize a program giving incentives to ranchers who create better range conditions by fostering cooperation of ranchers, environmentalists, and State and Federal agencies. The act also allowed 50 percent of grazing fees to be directed to range improvement.

On December 20, 1978, ranchers from Challis and agency representatives met at the Custer County Courthouse to explore local interest in the Experimental Stewardship Program. This was the beginning. Ninety-five percent of the Challis rangeland is publicly owned. Governor John Evans urged the Idaho rangeland committee to participate. Unanimously, they agreed to initiate the first Experimental Stewardship Program.

Since that time the Challis ESP steering committee has completed 21 of 22 allotment management plans. They have included irrigated pasture in some of the plans and have initiated new programs of wild horse management. New strains of improved forage producing plants are being used. The steering committee involves all interested parties in the planning process.

The bylaws for Montana's East Pioneer Experimental Stewardship Program were approved in April 1980. In the months that followed, program managers were able to avoid alternative year grazing on BLM spring ranges and greater than 50 percent reduction of animal unit months of grazing. Resource management planning with the adjacent National Forests has been stepped up. New attention has been focused on distribution of watering facilities for livestock and wildlife. Wildlife considerations, particularly for elk and deer, are being worked into allotment management plans, as well as a noxious weed management program. All this and more is encouraged by a new spirit of cooperation.

In June 1980, the ESP bylaws of the Modoc/Washoe area in Cedarville, Calif., were approved. The group has completed plans in 10 BLM and 4 Forest Service allotments. They have also obtained formal agreements with ongoing BLM and Forest Service advisory boards, provided input to a Sierra Club rangeland management document, developed a coalition to review the Wild Horse and Burro Act, and worked with a number of groups on developing and monitoring cooperative resource management and planning programs.

Retired Soil Conservation Service district conservationist Ernest Eaton of Cedarville, Calif., said, "Applying teamwork to range management was the key for us. We've worked out the kinks that come with any new system. What we've learned will make it easier for other areas interested in this form of coordinated planning."

The incentives and rewards to ranchers in the Public Rangeland Improvement Act are now surfacing. There is a let-up in stocking level reductions, allotment management plans are more flexible, and the development of integrated ranch-range plans is helping to improve overall operation. Ranchers in the three pilot areas are encouraged by the new cooperative environment ESP has fostered among their fellow ranchers, agency personnel, and environmental organizations.

As a result of the ESP, people are working together to develop coordinated resource management and grazing management programs. Their rangelands and related resources are improving—the vegetation, the wildlife, the soil, and the watersheds.

Warren E. Peden, Jr.,
State range conservationist, SCS, Davis, Calif.

Meetings

January	12–16	American Farm Bureau Federation, Atlanta, Ga.
	22–23	Great Lakes States Conservation Tillage Expo, Ft. Wayne, Ind.
	27–29	National Cattlemen's Association, San Antonio, Tex.
	28–30	International Symposium on Economic and Social Values of the Wildlife Resource, Syracuse, N.Y.
February	2–6	National Association of Conservation Districts, Nashville, Tenn.
	9–12	Land Improvement Contractors of America, Cincinnati, Ohio
	9–14	Society for Range Management, Orlando, Fla.
	27–28	International Erosion Control Association, Dallas, Tex.
March	2–4	American Pulpwood Association, St. Louis, Mo.
	2–5	National Farmers Union, Spokane, Wash.
	3–6	International Conference and Exposition on Automation in Agriculture and Food Processing, Chicago, Ill.
	16–21	American Society of Photogrammetry, Washington, DC
	20–23	National Wildlife Federation, Seattle, Wash.
	21–26	North American Wildlife and Natural Resources Conference, Reno, Nev.
April	5–9	American Planning Conference, Los Angeles, Calif.
	16–18	Southern Forestry Conference, Mobile, Ala.
May	4–7	Association of American Geographers, Minneapolis, Minn.
	19–21	The Garden Club of America, Pittsburgh, Pa.
	21–23	Boy Scouts of America, Louisville, Ky.
	25–28	National Council of State Garden Clubs, Chicago, Ill.
June	1–6	General Federation of Women's Clubs, Cincinnati, Ohio
	16–18	Conservation Tillage International Symposium, State College, Pa.
	16–19	National Agricultural Plastics Association, Peoria, Ill.
	22–26	American Seed Trade Association, San Diego, Calif.
	22–26	American Water Works Association, Denver, Colo.
	22–26	Forest Products Research Society, Spokane, Wash.
	22–26	North American Prairie Conference, Denton, Tex.

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